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(54) Title: ANTIPERSPIRANT COMPOSITION

(57) Abstract

A method of cooling skin comprising conveying a propellant composition to the skin as an aerosol, depositing the propellant on the skin and slowly volatilising the propellant to create a skin cooling sensation.

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ANTIPERSPIRANT COMPOSITION

The present invention relates to antiperspirant compositions. More particularly, the invention relates to aerosol compositions having improved cosmetic characteristics.

Antiperspirant and deodorant compositions can be applied to the skin by a variety of methods. Generally, such compositions comprise a carrier vehicle material in addition to an antiperspirant and/or deodorant active, the carrier and active being selected in accordance with factors such as the method of application, the intended use, the desired rheology and the desired cosmetic characteristics.

Aerosol compositions have gained wide consumer acceptance. Aerosol antiperspirant compositions generally comprise an anhydrous system comprising an antiperspirant salt dispersed in a liquid vehicle together with the liquified volatile propellant in a pressurised aerosol container.

Consumers can be divided into two classes - those who favour the use of antiperspirant aerosol compositions and those who favour deodorant aerosol compositions. Deodorant aerosol compositions do not contain significant amounts of antiperspirant active while the presence of the antiperspirant active in antiperspirant aerosol compositions imparts different cosmetic or sensory properties to the antiperspirant aerosol compositions. Generally, deodorant

composition contain high levels (usually 50% or over) of alcohol, which has a deodorising effect and which imparts an exceptionally cold or fresh feeling to the deodorant composition.

Conversely, antiperspirant compositions are usually incompatible with high levels of alcohol and generally do not impart a sufficiently cold feeling.

Many consumers therefore choose deodorants over antiperspirants in order to achieve a cold or fresh feeling on application. However, deodorants unlike antiperspirants fail to prevent sweat generation and also exhibit poor malodour reduction over time.

Accordingly, consumers who initially select an aerosol deodorant over an antiperspirant for initial freshness fail to enjoy the long term benefits of an antiperspirant.

US 4,152,416 describes aerosol antiperspirant compositions capable of dispensing an astringent solid with low mistiness and dustiness. A polymer gum is used in the aerosol composition to reduce the mistiness and/or dustiness of the aerosol composition.

US 4,806,338 also describes the use of amino functional silicones in antiperspirant aerosol compositions in order to improve the cosmetic properties of the composition.

Moreover, US 4,806,338 implies that the use of such silicones helps to prevent undesirable cooling on the skin.

EP 343,843 of the Mennen Company also describes the use of a substantivity fluid made up of a silicone polymer dissolved in a carrier fluid to prevent clogging of aerosol valves at low delivery rates.

An object of the invention is to provide an aerosol antiperspirant composition which provides the sensory benefits of an aerosol deodorant.

According to the invention there is provided a method of cooling skin comprising conveying a propellant composition to the skin as an aerosol, depositing the propellant on the skin and slowly volatilising the propellant to create a skin cooling sensation. Preferably, the propellant composition further comprises an antiperspirant active.

More preferably, the propellant has a boiling point between -45°C and +5°C.

Advantageously, the propellant is conveyed and deposited on the skin by a propellant-polymer mix. Preferably, the propellant-polymer mix comprises a silicone polymer. The silicone polymer can be a silicone gum or a silicone fluid.

In an alternative embodiment, the invention discloses the use of a silicone polymer as a skin cooling agent in the preparation of an aerosol composition comprising a antiperspirant active. The silicone polymer can be a silicone gum or a silicone fluid. Preferably, the silicone gum has a viscosity from 0.5 to 100 $m^{-2}sec^{-1}$ at 25°C. Suitable silicone fluids typically have a viscosity greater than 60,000 cSt.

According to a further aspect of the invention, there is provided use of a silicone polymer in an aerosol antiperspirant composition for the purpose of enhancing cooling to the skin. The enhancement of such cooling typically occurs on application, when the composition additionally comprises a volatile propellant material. In such circumstances, the combination of silicone polymer and volatile propellant may act as a skin cooling agent.

Suitably, the silicone gum is a polydimethylsiloxane gum, preferably a dimethicone and/or dimethiconol gum.

Accordingly, the present invention provides an antiperspirant composition having the skin cooling benefits of a deodorant composition.

Accordingly, a consumer can enjoy the sensory benefits of a deodorant and the efficacy of an antiperspirant.

The particulate antiperspirant material of the invention can be any of the known antiperspirant active materials. Particularly preferred materials are astringent metallic salts, in particular the inorganic and organic salts of aluminium, zirconium and zinc and mixtures thereof. Particularly preferred are the aluminium and zirconium salts such as aluminium halides, aluminium hydroxide halides, zirconium hydroxy halides, zirconium oxide halides and mixtures thereof. Generally, such aluminium and/or zirconium salts are any of those well known in the art. US patent no. 4,152,416 describes various aluminium zirconium salts which are suitable for use in the present invention. Typically, the antiperspirant active is present at from about 0.1% to about 20% by weight of the composition.

Generally, the silicone gums suitable for use in the present invention are as defined in US 4,152,416 and have a viscosity ranging from about 0.5 to 100 m^2sec^{-1} (500,000 to 100,000,000 centistokes) at 25°C. Typical silicone gums are the polydimethylsiloxane polymers such as dimethiconol and dimethicone gums.

The silicone gum is preferably present at levels from about 0.05% to about 6% by weight, more preferably from about 0.1% to about 4% by weight of the composition.

Alternatively or in addition to the silicone gum, silicone fluids can also be used to generate a cooling effect

according to the invention. Suitable fluids are the DC200 series of silicones available from Dow Corning.

The aerosol antiperspirant compositions of the present invention also preferably contain additional solvent or carrier material. Particularly preferred are volatile low viscosity fluid components.

The term "volatile" does not exclude materials that are only slowly volatile and require a longer time to evaporate than the known volatile silicones.

A particularly preferred series of volatile liquid carriers are the cyclomethicone liquids. Generally, the volatile low viscosity liquids usable in the present invention have a boiling point of at least 100°C and a viscosity of less than $1 \times 10^{-5} m^2 sec^2$ (10 centistokes) at 25°C. The volatile silicone fluids utilised at levels of about 1% to about 30%, preferably from about 2.5% to about 14.5% by weight of the composition.

Suitable silicone gums and volatile silicone fluids are available as standard proprietary material mixes or solutions e.g. Q21401 available from Dow Corning. SE30, a gum available from the General Electric Company can also be used.

The compositions of the invention also contain one or more volatile aerosol propellant materials which in a gaseous

state carry the other components of the invention in particulate or droplet form. Suitable propellants have a boiling point in the range of from -45°C to about 5°C and are present at levels from about 3.5% to 90% by weight of the composition.

Suitable aerosol propellants are well known in the art and include the chemically inert hydrocarbons such as propane, n-butane, isobutane, cyclopropane and mixtures thereof.

The antiperspirant compositions of the present invention also comprise a suspending agent to suspend the antiperspirant actives. Suitable suspending agents include colloidal silicas and hydrophobic clays such as the bentonites. A particularly preferred bentonite is hydrophobic bentonite e.g. Bentone which is a bentonite treated with hydrophobic cationic materials. Typically the suspending agents are utilised at from about 0.3% to 3% by weight of the composition.

In addition, masking agents to conceal antiperspirant active suitable for use in the compositions according to the present invention can be included. Suitable masking agents are selected from aliphatic hydrocarbons (e.g. C8-C30, preferably C10-C16, more preferable C12-C15 linear or branched hydrocarbons), aliphatic esters, aromatic esters and mixtures thereof. The preferred residue masking agents for use in the compositions according to the present invention are C8-C30, preferably C10-C16, more preferably

C12-C15 mono- and di-alkyl esters of aromatic carboxylic acids inclusive of the benzoates and phthalates. Suitable masking agents include isopropyl myristate, isopropyl palmitate, polydecenes, Fluid AP, the Finsolv range of benzoate esters and mixtures thereof which can be used at ranges from 0.5% to 25% by weight of the composition.

In addition to the abovementioned ingredients customary adjuncts of aerosol antiperspirant compositions can also be included in the composition. Such adjuncts include perfumes, bactericides, fungicides, emollients and other skin treating materials.

The following are examples of compositions within the scope of the present invention. The invention is further illustrated by way of example only, with reference to figure 1, which shows a thermal imaging graph of recorded temperature over time with the spraying of various compositions. In the examples, all percentages of the specified ingredients are weight percentages.

EXAMPLE 1

Material	Chemical	Supplier	Level (%wt/wt)
AACH	Activated aluminium chlorohydrate	Giulini	2.0
Q2-1401	Dimethiconol gum in cyclomethicone	Dow Corning	1.0
	Cyclomethicone	Dow Corning	5.2
Bentone 38	Quaternium-18 hectorite	Rheox	0.8
	Perfume		1.0
	Butane/Isobutane/ Propane		90.0

EXAMPLE 2

Activated aluminium chlorohydrate	10%
Cyclomethicone	5.0%
Fluid AP	6.0%
Bentone 38	1.0%
Fragrance	0.5%
Q2-1401	2.5%
Propellant	75%

EXAMPLE 3

Activated aluminium chlorohydrate	1.0%
Cyclomethicone	7.6%
Bentone 38	0.3%
Fragrance	1.0%
SE 30	0.1%
Propellant	90%

EXAMPLE 4

Aluminium Chlorohydrate	10%
DC 344*	18.0%
Isopropyl palmitate	6.0%
Q2-1401	1.0%
Bentone 38	1.5%
Ethanol	10%
Fragrance	0.7%
Talc	2.8%
Propellant	50%

*DC 344 is a cyclomethicone tetramer available from Dow Corning.

EXAMPLE 5

Activated aluminium chlorohydrate	3.0%
DC 200 [60,000cS]	1.0%
Cyclomethicone	9.0%
Bentone 38	1.0%
Fragrance	1.0%
Propellant	85%

The following comparative data illustrate the effect of the presence of a silicone gum on the cooling effect of an aerosol antiperspirant formulation as described in Example I.

COMPARATIVE EXAMPLE 1

1. Thermal Imaging Data

The surface temperature of a patch of forearm skin was recorded using a calibrated Infra-red thermal imaging camera. The initial temperature recorded was 34.2°C.

Two aerosol products were sprayed onto the skin from a distance of 6 inches; a standard alcoholic deodorant made up of 50% propane, 0.5% perfume and 49.5% ethanol and a composition of the invention in accordance with Example 1. The temperature was recorded every ten seconds up to 90

seconds after application (Table 1). Table 1 clearly shows that for 1% Q2-1401, the skin was 4°C cooler following application than the alcohol deodorant and a temperature differential was maintained until approximately 30 seconds had elapsed.

Accordingly the data clearly demonstrates that antiperspirant aerosols of the invention have a cooling effect similar to if not better than an alcoholic deodorant.

TABLE 1: IR Imaging Data

		Time after application (s)									
		0	10	20	30	40	50	60	70	80	90
% Q2-1401	0.5	-0.3	22.9	26.8	28.6	29.8	30.3	31.0	31.2	31.9	31.9
	1.0	3	23.8	26.8	28.6	29.6	30.3	30.8	31.2	31.5	31.9

2. QDA Sensory data

A trained panel assessed the formulation of Example I to compare same with an alcoholic deodorant. The panel was asked to describe the sensory properties of a product in terms of Quantitative Descriptor Analysis i.e for each descriptor to give a score from 0 to 100 on the intensity experienced. For two products to be significantly different on an attribute typically a 20 point difference was required. The results are presented in Table 2. It can be seen that;

1) both products were as cold
2) Example 1 was drier
3) Example 1 stung less
4) both products were equally adhesive
5) both products were as fresh
6) Example 1 was less wet
7) Both products were as tightening
8) Both the products gave equally low deposits

TABLE 2: QDA Sensory Data

Attribute	Alcoholic deodorant	Example 1
Cold on application	68.1	66.2
Wet on application	43.4	21.7
Stings on application	36.1	12.9
Sticky after application	21.8	26.1
Fresh after application	55.9	68.1
Wet after application	40.7	18.7
Tight after application	13.3	21.9
Deposit level after application	8.5	17.3

TABLE 3: Deodorancy Test

This test was conducted on a panel of female subjects and results obtained after 24 hours. Each product was applied using a 2 second spray from a shaken can, 6 inches away from the axilla and deodorancy tested by a third party.

The results were as follows:

	Mean Malodour Score 24hr	Mean Dosage (mg)
Example 1	1.28	2010
Example 1 without silicone	1.39	1940
Deodorant	1.60	1950

Difference for significance @ 95% 0.14

Difference for significance @ 99% 0.19

In this evaluation no significant difference in deodorancy efficacy was found between the two AACH-containing products and both of these were superior to the ethanolic deodorant after a 24 hour wear period at a 99% level of confidence.

Accordingly, the compositions of the invention have the desirable sensory attributes of a deodorant (cooling and freshness), but benefits from antiperspirancy greater protection from malodour (>99% significantly less malodour than a deodorant after 24 hours) and is drier, and stings less.

Although the Applicants do not wish to be bound by any theory, it is believed that use of silicone gum in the antiperspirant compositions of the invention causes the propellant which is dissolved in the viscous gum to be conveyed to the skin surface. In prior art compositions propellant is not conveyed to the skin. Accordingly, in the

present invention the propellant is volatilised by body heat at a slow rate thereby generating the desired deodorant type cooling effect.

In particular it is believed that any polymer material which raises the viscosity of the composition on the skin such that it retards evaporation of propellant may be suitable for conveying and depositing propellant on the skin surface.

Comparative Example 2

Thermal data

Three K-type thermocouples were arranged in a vertical line, and used to measure the temperature of various incident sprays. Temperature profiles were measured when various aerosols were sprayed at the thermocouple array for a period of 2 seconds , and from a distance of 2cm.

Four compositions were used; the first was an alcoholic deodorant containing 50% propellant, 0.5% perfume and 49.5% ethanol, and the second was an antiperspirant aerosol composition containing 10% antiperspirant active, 1.0% Bentone 38, 0.65% perfume, 13.35% cyclic silicone, and 75% propellant. The third composition was the same as Example 1 described above, whilst the fourth composition comprised 2% antiperspirant active, 0.2% Q2-1401, 1.0% 300,000cSt dimethicone, 5.1% cyclic silicone, 0.7% Bentone 38, 1.0% fragrance, and 90% propellant.

Spraying these formulations, it was found that the alcoholic deodorant composition produced an initial temperature drop from around room temperature (25°C) to 7°C. The second composition produced a temperature drop to 1°C. The third composition (containing silicone gum) produced a temperature drop to -13°C, whilst the fourth composition produced a temperature drop to -16°C.

The results are shown graphically in Figure 1. In this example, although the temperature drop recored for the alcoholic deodorant is actually less than for the antiperspirant compostion containing no silicone gums or fluids, in practice on application to the skin the alcoholic deodorant feels cooler than the second composition, since the ethanol in the alcoholic deodorant has a relatively high heat of vapourisation, and hence removes more heat from the skin when it vapourises. Also, alcohol will wet the skin more effectively than silicones. The remaining examples, all of which contain silicone gums or fluids, do not remove so much heat from the skin on application, since the heat of vaporisation of silicone is less than that of ethanol. As such, even though relatively low temperatures can be recorded by the thermocouple(e.g. -16°C), these compositions do not feel unpleasantly cold on application.

CLAIMS

1. A method of cooling skin comprising conveying a propellant composition to the skin as an aerosol, depositing the propellant on the skin and slowly volatilising the propellant to create a skin cooling sensation.

2. A method as claimed in claim 1 characterized in that the propellant composition further comprises an antiperspirant active.

3. A method as claimed in claim 1 or claim 2 characterised in that the propellant has a boiling point between -45°C and 5°C.

4. A method as claimed in any of claims 1 to 3 characterised in that the propellant is conveyed and deposited on the skin by a propellant-polymer mix.

5. A method as claimed in claim 4 characterised in that propellant-polymer mix comprises a silicone polymer.

6. A method as claimed in claim 5 characterised in that the silicone polymer comprises a silicone gum.

7. A method as claimed in claim 5 characterised in that the silicone polymer is a silicone fluid.

8. Use of a silicone polymer as a skin cooling agent in the preparation of an aerosol composition comprising an antiperspirant active.

9. Use of a silicone polymer as claimed in claim 8 characterised in that the polymer is a silicone gum.

10. Use of a silicone gum as claimed in claim 9 characterised in that the gum has a viscosity from 0.5 to $100m^{-2}sec^{-1}$ at 25°C.

11. Use of a silicone gum as claimed in claim 10 characterised in that the gum is a polydimethylsiloxane gum.

12. Use of a silicone gum as claimed in claim 11 characterised in that the gum is a dimethicone and/or dimethiconol gum.

13. Use of a silicone polymer in an aerosol antiperspirant composition for the purpose of enhancing cooling to the skin.

14. Use of a silicone polymer as claimed in claim 13, wherein the cooling effect occurs on application of the aerosol antiperspirant.

15. Use of a silicone polymer as claimed in claim 13 or claim 14, wherein the antiperspirant composition additionally comprises a volatile propellant material.

16. Use of a silicone polymer as claimed in any one of claims 13-15, wherein the propellant has a boiling point between -45°C and 5°C.

17. Use of a silicone polymer as claimed in any one of claims 13-16, characterised in that the propellant is conveyed and deposited on the skin by a propellant-silicone polymer mix.

18. Use of a silicone polymer as claimed in any one of claims 13-17, characterised in that the silicone polymer comprises a silicone fluid.

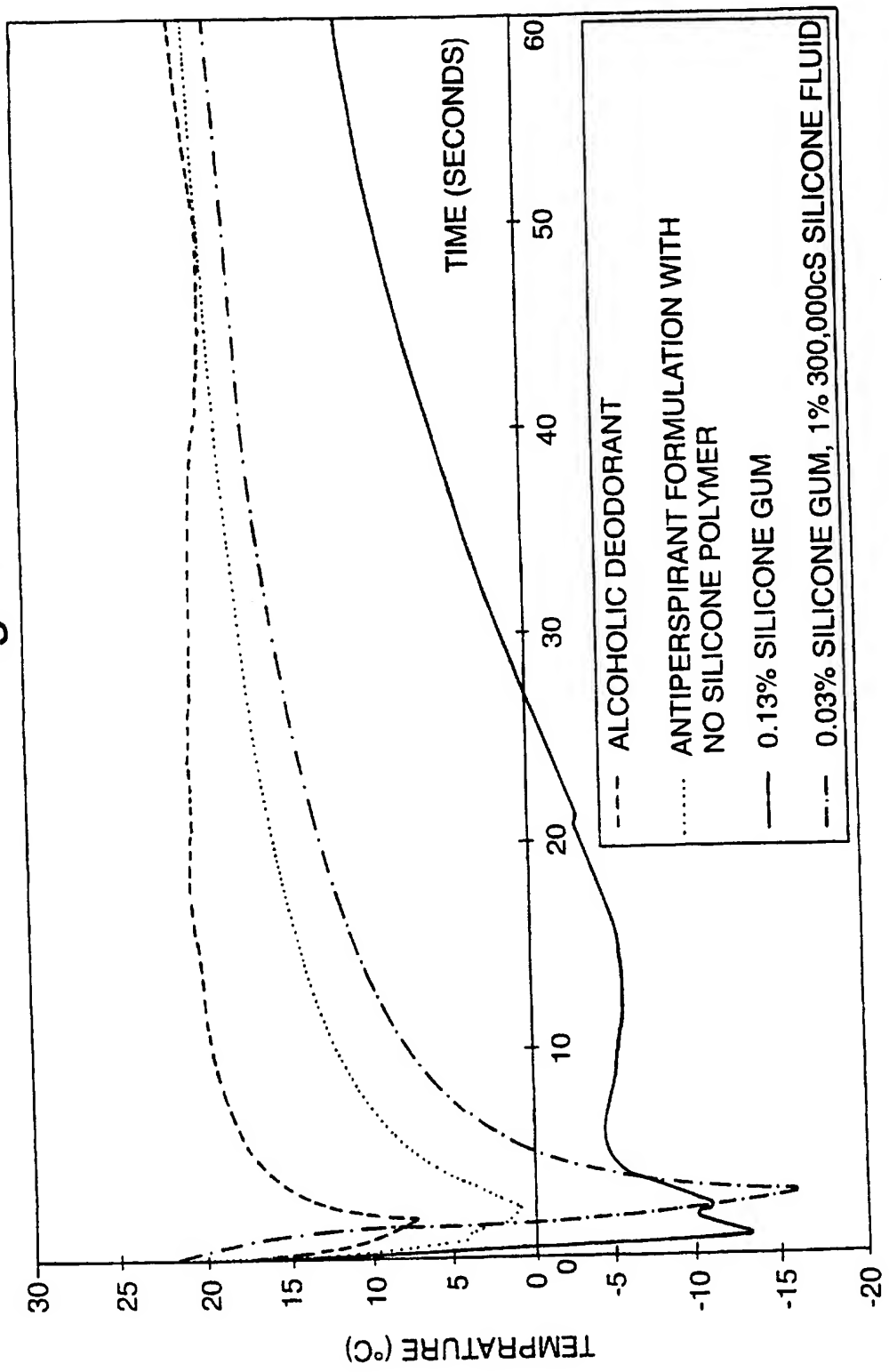
19. Use of a silicone polymer as claimed in any one of claims 13-18, characterised in that the silicone polymer is a silicone gum.

20. Use of a silicone polymer as claimed in claim 19, characterised in that the gum has a viscosity of 0.5 to 100 $m^{-2}sec^{-1}$ at 25°C.

21. Use of a silicone polymer as claimed in any one of claims 19-20, characterised in that the silicone gum is polydimethylsiloxane gum.

22. Use of a silicone polymer as claimed in claim 21, characterised in that the gum is a dimethicone and/or dimethiconol gum.

Fig.1.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25
20
15
10
5
0
-5
-10
-15
-20
TIME (SECONDS)
0
10
20
30
40
50
60
ALCOHOLIC DEODORANT
ANTIPERSPIRANT FORMULATION WITH NO SILICONE POLYMER
0.13% SILICONE GUM
0.03% SILICONE GUM, 1% 300,000cS SILICONE FLUID

INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/EP 97/02983

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61K7/00 A61K7/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 806 338 A (S.E.SMITH) 21 February 1989 cited in the application see claims 1,7-10 see column 4, line 30-42 see column 5, line 13-60 ---	1-22
X	US 5 082 652 A (L.MAYFIELD E.A.) 21 January 1992 see claims 1-3,11-13 see column 7, line 28-40 ---	1-22
X	EP 0 452 762 A (GENERAL ELECTRIC) 23 October 1991 see claims 1,9-12,21,22 see page 4, line 55 - page 5, line 1 see page 5, line 44-57 --- -/--	1-22

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
30 September 1997	15. 10. 97

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Peeters, J

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INTERNATIONAL SEARCH REPORT

Inte. onal Application No
PCT/EP 97/02983

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 160 732 A (D.E.KATSOULIS E.A.) 3 November 1992 see claims 1,19 see column 3, line 67 - column 5, line 65 see column 7, line 43-57	1-22
X	GB 2 273 299 A (NELLY KAMEL RIZK) 15 June 1994 see claims 1,11,12,15,16,19,21-27 see page 4, paragraph 5 see page 9, paragraph 4	1-3

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter nal Application No
PCT/EP 97/02983

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